Flooding in populated areas along the Columbia River.

Chapter 11 Post-War Multi- Purpose Development of the Columbia

Columbia Basin Multiple-purpose Projects

The multiple-purpose development of the Columbia River Basin made great progress after World War II. Significant benefits in power, flood control, navigation, and irrigation resulted from federal dam construction in the basins of the Columbia and Snake rivers. The efforts to control the waters of the Columbia and its tributaries reflected the fundamental goal of federal water resource policy in the Pacific Northwest, which has been to wisely and efficiently use the rivers to benefit the entire region.

Until the establishment of the Walla Walla District in November 1948, the Portland District had responsibility for improvements on the Snake River, as well as on the Columbia downstream from the mouth of the Snake. After Congress approved the Bonneville Dam project, agricultural and commercial interests in eastern Oregon and Washington and western Idaho applied intense pressure for river improvements on the Snake and middle Columbia. In the mid-1930s, Congress directed the Corps of Engineers to supplement, in light of changing conditions, the 308 studies and a previously submitted report on the Snake River to determine if any new projects were advisable as far upstream as Lewiston, Idaho.[1]

Based on field studies by the Portland District, Division Engineer Colonel Thomas Robins recommended in 1937 a series of four multiple-purpose dams with channel improvements on each river. Because the cost of the project would outweigh the benefits in the short term, he did not propose immediate construction of the items in his coordinated plan. The Chief of Engineers concurred in presenting the study as "a general guide for future development of the waterway," whenever Congress saw fit to proceed with individual projects. When ultimately begun, the plan gave precedence to the Umatilla Dam and four Snake River dams primarily in the interest of improved navigation, since an adequate channel already existed below the Umatilla Rapids. Local interests, displeased with postponement of their pet project, urged immediate prosecution of the coordinated plan. They held "that each year of delay in completion of a suitable navigation channel to Lewiston compounds the losses in the marketing of products of the farm, forest, and mine by reason of noncompetitive freight rates."[2]

Local interests also believed that the Corps estimated future power needs of the region too conservatively. In this opinion they had the enthusiastic support of J. D. Ross, the new Bonneville Power Administrator. Ross wrote to President Roosevelt that

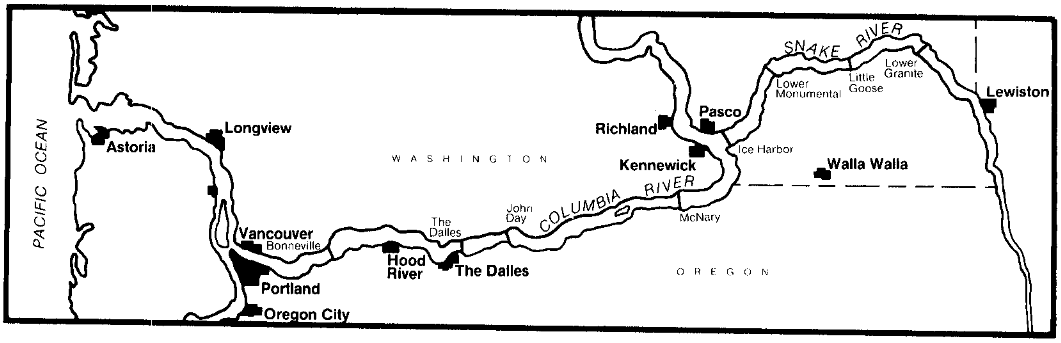
> *the Umatilla or whatever plant is chosen on the Columbia will not be finished any too soon as far as power is concerned for these great works take several years to build. No great hydropower plant ever goes begging these days . . . . I am, therefore, very enthusiastic for the early construction of the Umatilla dam or a dam of that size on the Columbia together with the unit on the Snake river. Whatever portion you feel the power should pay for we will gladly get to work to return the money to the project by building a market.*[3]

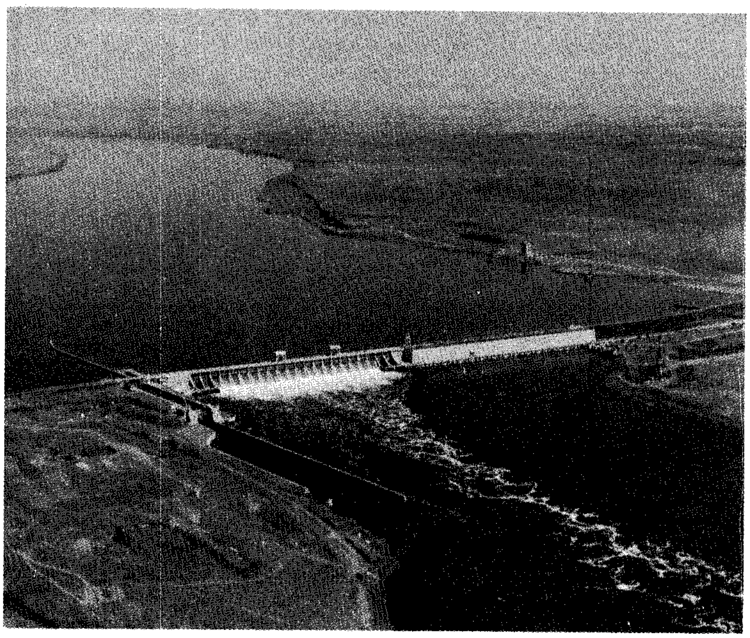
Spurred on by the Inland Empire Waterways Association and Senator Charles McNary, Bonneville District Engineer Major Theron Weaver requested funds in June 1938 to begin construction of the Umatilla Dam. However, the administration refused to back the project at that time. Rivalry between the Interior Department and the Corps of Engineers partly accounted for the delay. The Interior Department feared that the Corps' lower Snake development would interfere with its own plans for irrigation projects on the upper Snake.[4]

In February 1942, the Portland District again sought funds for preliminary planning of Umatilla Dam. The division engineer rejected the request "inasmuch as there is no likelihood that the Umatilla Project will be authorized for construction in the near future." Finally, Congress authorized the dam in March 1945, changing the name of the project to McNary Dam in honor of the late senator from Oregon.[5]

While the Portland District designed and supervised initial construction of McNary Dam, the project was transferred to the new Walla Walla District in November 1948. The work carried out by the Portland District included excavation for the navigation lock area, access roads, placement of the large north shore cofferdam enclosing much of the spillway, and north-side fish passage facilities. The Corps designed the dam to house 14 turbine generator units of 70,000 kilowatts each, a 22-bay spillway, and a navigation lock 86 by 675

Map of populated area along the Columbia.





McNary Dam

feet. The Walla Walla District completed the 7,300-foot-long structure in 1953.[6]

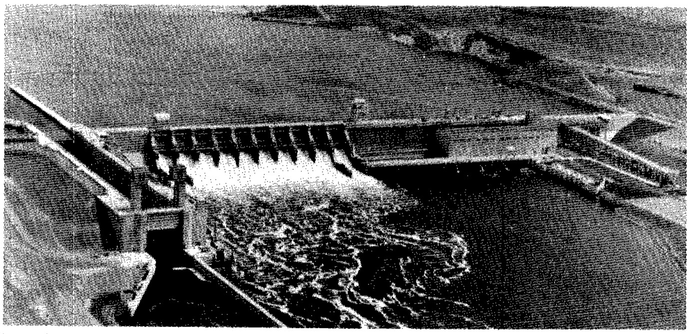
The 1945 River and Harbor Act which authorized McNary Dam also approved four dams for the lower Snake. The dams—Ice Harbor, Lower Monumental, Little Goose, and Lower Granite—had a hydroelectric potential estimated at 1,485,000 kilowatts at construction, with expansion up to 3,033,000 kilowatts. The structures would promote irrigation by creating slackwater pools at higher elevations and by supplying low-cost electricity to power the pumping systems. Each dam would have navigation locks 86 by 675 feet, with 15 feet depth over the sill.[7]

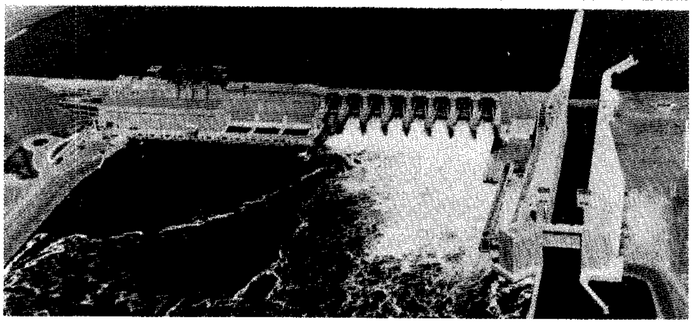
The Portland District conducted the surveys and studies for selection of these four dam sites. At Ice Harbor, the district carried out more than 85 percent of the field exploration which consisted of core and churn drilling to test foundations as well as test pits. The district performed about 30 percent of the planning and design specifications for Ice Harbor Dam, including a model of the project made at the district hydraulic laboratory at Bonneville Dam. At Lower Monumental Dam, the Portland engineers completed a topographic survey of the site and conducted a hydrographic survey during the 1948 spring freshet. The district also prepared reports on real estate purchase requirements, railroad and highway relocation, and water flow for Ice Harbor and Lower Monumental dams. Work at Ice Harbor and Lower Monumental totalled $356,000 and the cost of the land at all four projects amounted to $500,000.[8]

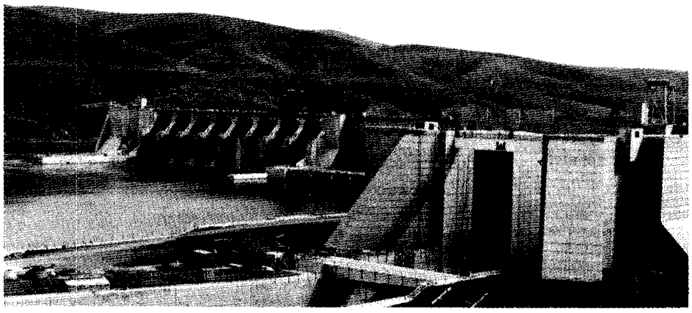
The previous open-river channel improvements would be eliminated by the navigation pools provided by the four dams, except that portion reaching to Johnson's Bar above Lewiston. Up to 1948, the Portland District had spent about $475,000 for open river improvements on the lower Snake, excluding $85,000 allotted to the Corps by the Washington State Legislature in 1907 for the same purpose. The Walla Walla District completed construction of Ice Harbor Dam in 1962. Lower Monumental opened to navigation in 1969 and Little Goose, in 1970. First power from Lower Granite came on line in 1975. Each project contained fish passage facilities.[9]

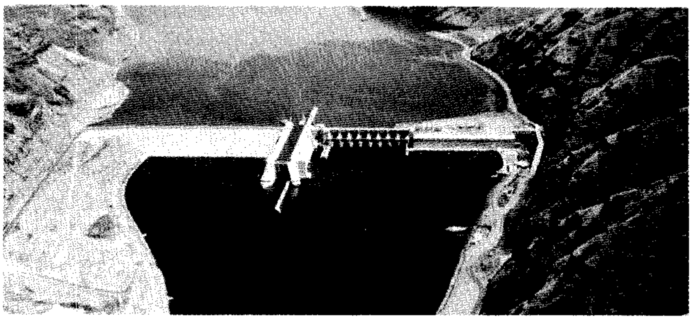
Flood of 1948

The destructive flood of June 1948 quickened the Corps of Engineers' preparations for post-war improvements on the Columbia River. Rapidly melting heavy snowpack augmented by heavy rains historically caused flood-stage runoff in the Columbia River. Heaviest floods happened when weather conditions concentrated the runoff in a short period. Such a situation produced the greatest flood of record on the Columbia in 1894,


Ice Harbor Dam


Lower Monumental Dam


Little Goose Dam

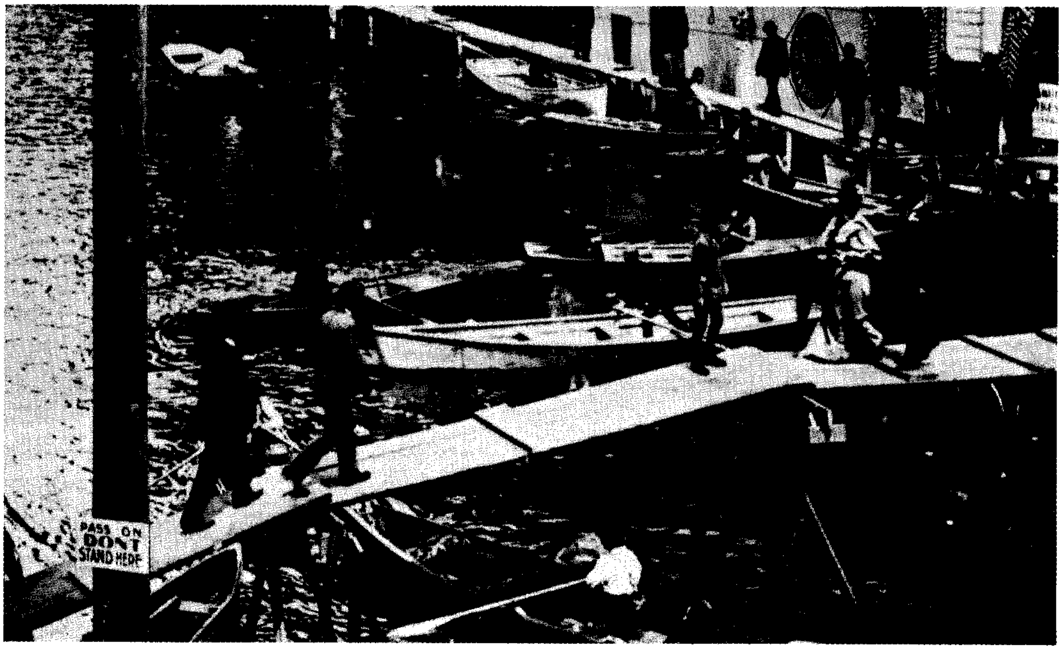

Lower Granite Dam

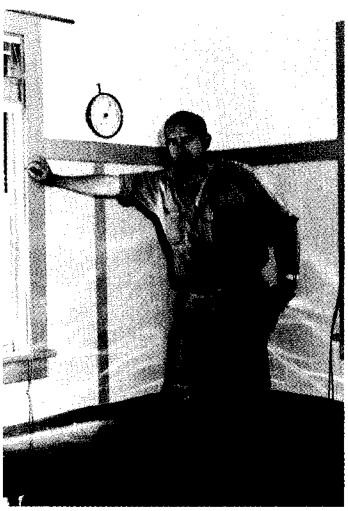
when peak discharge measured at The Dalles reached 1.2 million cubic feet per second (cfs). Previously, in 1876, another large flood generated flows of one million cfs. The amount of water annually passing down the Columbia averaged about 180 million acre-feet minus ten million acre-feet consumed by irrigation.

Weather conditions during late spring combined with a heavy snow-pack to cause the flood of 1948.[10] During the winter of 1947-48, the mountains of the Pacific Northwest and the Rockies lay under a deep blanket of snow. Temperatures in the first part of the spring ranged below normal and in the second half, considerably above normal. In the critical period of the last half of May and the first half of June, heavy precipitation fell. Such conditions sent a tremendous volume of water pouring off the mountains into the streams and rivers which feed the Columbia. The Kootenai, Clark Fork, Clearwater, and the Snake contributed the most water. By the time highest flood waters reached the gauging stations at The Dalles on 31 May, over one million cfs roared downstream to the lower Columbia area. For nearly three weeks, the water flowed not less than 900,000 cfs in comparison to the average annual peak discharge on the Columbia of about 583,000 cfs.

The main flood plain area on the Columbia River lay below Bonneville Dam. It consisted of a series of low, flat areas generally three to four miles wide and five to ten miles long, separated by sloughs or minor tributaries entering the main channel. This area contained a heavy concentration of population, industry, and transportation facilities. Almost 181,000 people either lived in the flood plain or had jobs within the lands subject to flooding.

right: The 1894 flood in Portland forced people to boats and bridges, below: In the 1948 flood, Portland District Government Moorings suffered from knee-deep water. below, right: The 1948 flood put underwater many of the same parts of Portland as did the 1894 flood.





Limited flood protection works existed on the Columbia River below the mouth of the Yakima. Local interests had built levees at Umatilla, Oregon, and Bingen, Washington. The Corps had erected levees and flood walls and had installed pumping apparatus at The Dalles and Hood River, Oregon. Between the mouth of the Sandy River and the Pacific Ocean, 61 flood control projects had been constructed cooperatively by the Corps and local drainage and diking districts. These projects included levees, flood walls, revetments, bulkheads, drainage canals and ditches, pumping plants, and tide gates—all designed to protect 73,000 persons and about 97,000 acres of land. A substantial concrete harbor wall, about one mile long on the west side of the Willamette River, protected the Portland commercial area from rising waters resulting from upstream Willamette Basin floods or Columbia River backwater.

In the late spring of 1948, the flow of the Columbia River progressed in normal fashion until 19 May when an unusually large daily rise occurred. This continued until 23 May when runoff assumed proportions of a major flood. The next day the Portland district engineer notified the Chief of Engineers that The Dalles-Celilo Canal was inundated; three days later, the turbulent Columbia overtopped the McNary cofferdam. Precipitation eased for a few days, but returned with renewed intensity on 26 May and lasted to the 29th. Storms again took place 3 to 4 June and 9 to 11 June.

By 27 May, a lower levee at Clatskanie had been topped, railroad travel hampered, and drainage and diking districts notified the district that they faced seepage, clogged drains, and sand boils. The district engineer issued instructions for patrolling and maintaining levees;

Levees built to prevent flood damage.

Oregon National Guard boat used for evacuation of flooded areas.

sandbagging and evacuation operations commenced. The district dispatched employees to over 25 locations as flood-control supervisors.

On 28 May, drift and debris clogged the upstream face of the powerhouse at Bonneville Dam. The Camas city dock was in danger of washing away. The state police, Red Cross, and municipal organizations stepped up evacuation activities. The Portland District abandoned its mooring area, and the river stage on the Vancouver gauge now read 25.4 feet, 5.4 feet above flood stage, and remained over 25 feet for 27 days. The Oregon State Police blocked off U.S. Highway 30 near The Dalles, while troops arrived at Vancouver Barracks from Fort Lewis for assistance. Division and district Corps of Engineers offices in Portland placed employees on standby duty for the holiday weekend. Up to that point, 13 persons had lost their lives in the flood disaster.

By 29 May, water had risen to 26.7 feet at Vancouver; and meteorologists predicted it would rise four more feet, which would be two feet over the top of local levees. The rampaging river inundated additional roads and destroyed communication systems along the river, forcing more evacuations in exposed areas. The district rushed thousands of sandbags to endangered locations and assigned additional Corps personnel for patrol and supervisory duty at flood scenes and protection works. The Washington National Guard mobilized in the Pasco-Richland-Kennewick area. High water now undermined roads on the Washington shore between Bingen and Camas. Lower Columbia industrial and utility properties began experiencing flooding. The Camas-Washougal area reported looting, and National Guard units commenced police duty. The Vancouver shipyards and airport came


Sandbags dumped for use as temporary levee.

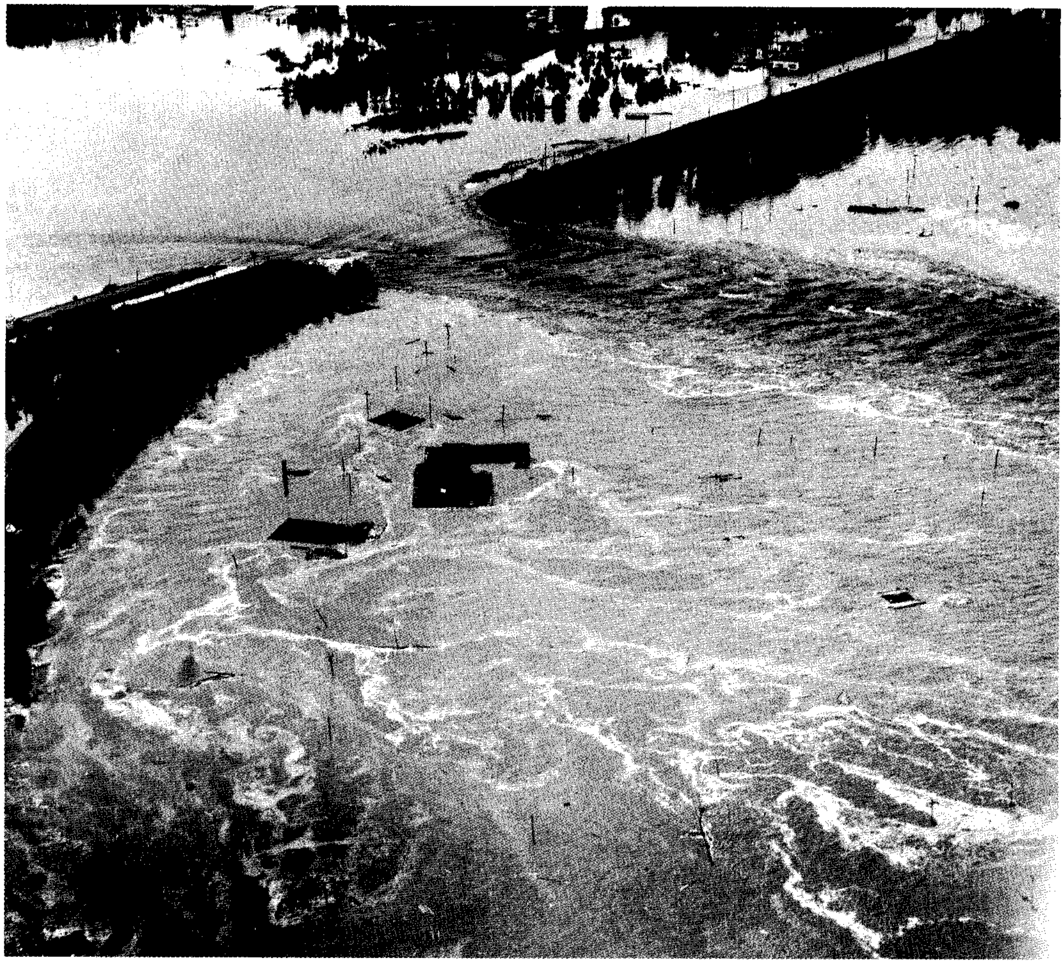

River level is monitored carefully as it nears flood stage.

under water, and more troops arrived from Fort Lewis. As water continued to rise through the night of 29 May, the Corps stepped up operations at all danger spots. The flood finally reached its peak at The Dalles on the night of 31 May, hitting 1.01 million cfs. Conditions steadily worsened while the river remained above 900,000 cfs for 17 days.

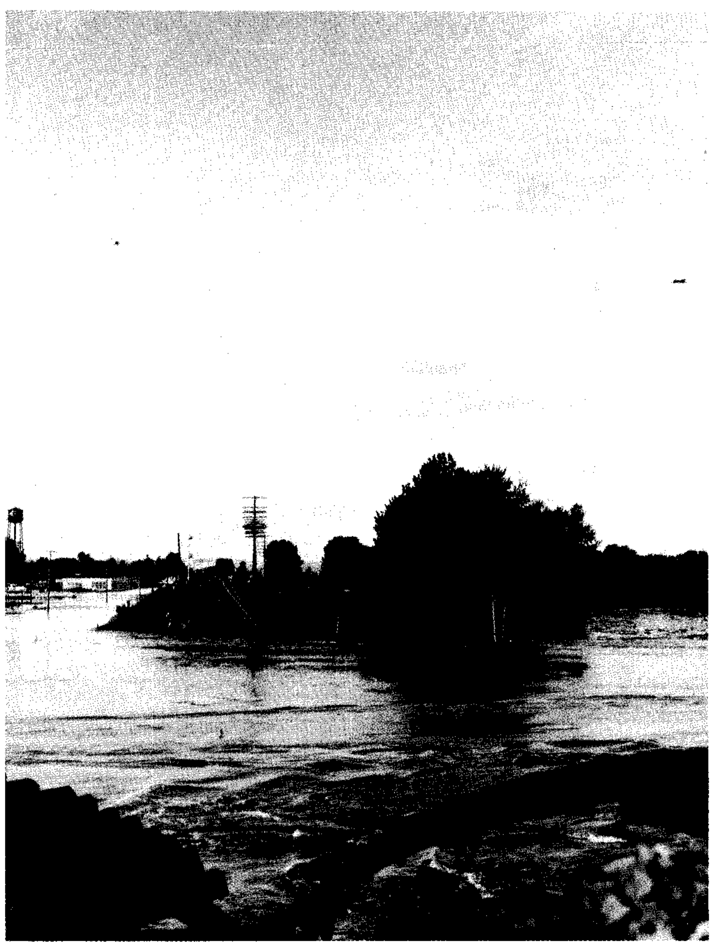
On 30 May, several locations along Front Avenue in Portland north of the area protected by the flood wall came under six inches of water. Hundreds of citizens and soldiers frantically worked on building up levees at locations throughout the lower Columbia area. Authorities closed many bridges except for emergency traffic. At The Dalles-Celilo Canal, two barges slipped their moorings and floated over the north wall into the river. Seepage problems on many dikes and levees became serious, weakening the structures to the point of collapse. Water entered three buildings at the Portland District's moorings facility.

Then disaster struck the community of Vanport, Oregon, a wartime housing project containing 18,500 residents. Entirely circled by dikes, Vanport sat several feet below the level of the Columbia on one side and a slough on the other. In late afternoon on Sunday, Memorial Day, at about 4:00 p.m. a railroad fill, which served as part of the protective dike system, failed. Within minutes the breach had widened to about 600 feet. After two hours, 10 to 20 feet of debris-laden water completely inundated Vanport, destroying nearly all buildings. Most people fled on foot because over 400 stalled automobiles jammed traffic at the exits from the community. Most residents were unable to salvage even small household effects, and rescue workers had to lift some people from the roofs of floating apartment buildings. The destructive flood waters caused an almost total loss of public and private property and killed 15 people. Had the tragedy occurred at night or during a weekday, loss of life would probably have been much higher.

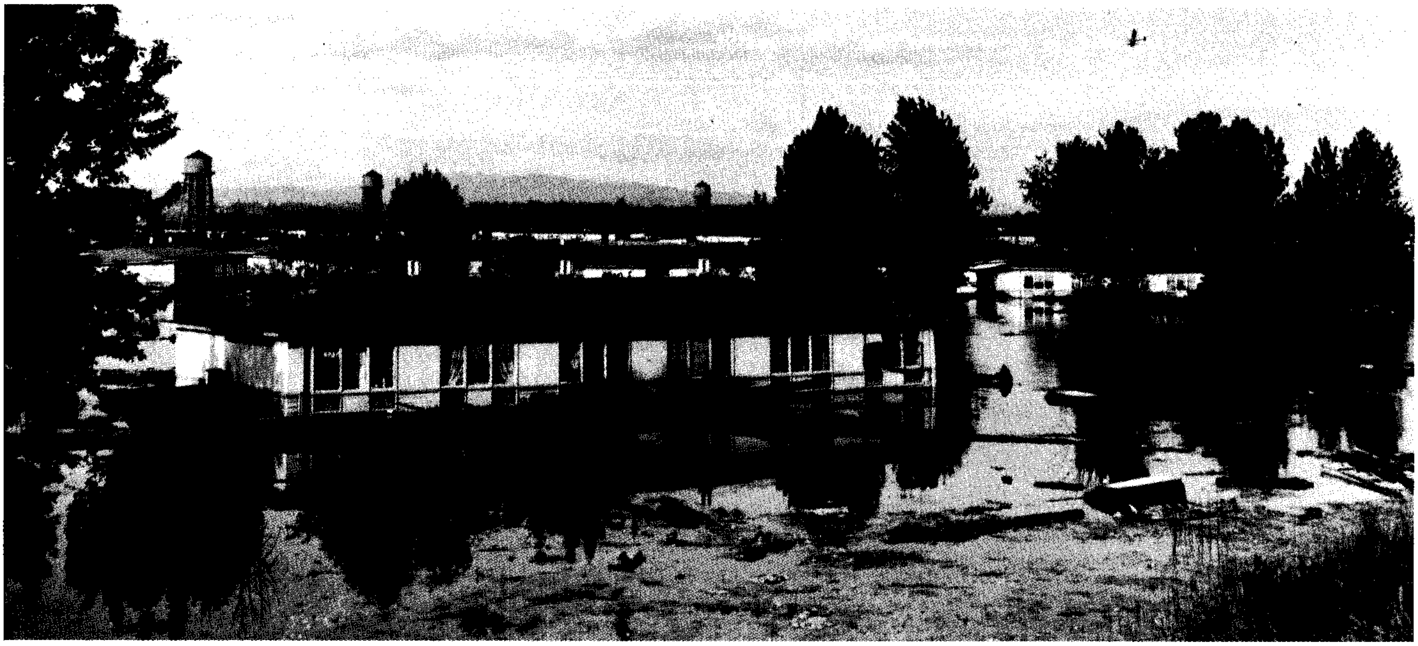
For six days prior to the breach, crews had constantly inspected the entire dike system, including the railroad fill that eventually failed. In a subsequent report, Division Engineer Weaver telegraphed to the Chief of Engineers that "the situation appeared at all times to be quite favorable and under full control by those charged with the responsibility for maintenance of the flood protection project." On 30 May, a crew foreman noticed a crack in the fill and called for a Corps inspector. While they examined it, according to Colonel O. E. Walsh, "the entire section seemed to disappear at once, and both foreman and inspector had to run for their lives."[11]



Water rapidly moved into community of Vanport after dike gave way.



Vanport railroad dike washout.



above: Only second story of building was visible above water covering Vanport. right: Overview of Vanport shows devastation

For the next 14 days the flood situation in the lower Columbia River worsened, although water levels declined somewhat from the 31 May peak. Constant, prolonged pressure on levees and dikes threatened inundation of several areas. The Reynolds Aluminum plant at Troutdale, although in considerable danger, at first refused to shut down, claiming that it would cost the company $10 million. Hundreds of additional troops arrived, and the Navy sent in men and equipment. Authorities issued over one hundred thousand sandbags each day. Portland District personnel advised all residents living behind dikes to move out immediately; the prospect of another Vanport terrified people. The northern sections of Denver and Union avenues in Portland now came under water.

During the first two weeks of June, several dikes, roadways, and levees failed or were overtopped. A count on 7 June showed 2,000 military personnel had come to fight the flood. The Corps of Engineers dispatched 25 officers from Fort Belvoir, Virginia, to help. About 5,000 civilians remained on patrol and work shifts. Rains on 12 June complicated flood-fighting efforts. That night highest flood levels reached Longview, Washington; but all protection works held. The Portland Airport became flooded and suffered extensive damage. On 14 June, conditions finally began to improve, and by 17 June demobilization and cleanup operations commenced. On 23 June, the water returned to safe levels; and T. W. Ragsdale, Chief of the Portland District Operations Division, issued his final flood report and halted active field emergency work.

Throughout the flood fight, hundreds of Portland District personnel worked overtime shifts, rendering emergency assistance, material, and supervision to maintain existing protection works and to construct temporary ones along the rampaging Columbia. The experience pointed up the need for a definite flood fight plan and for improvements to the lower Columbia levee system. After the battle with the river ended, the public praised the flood work of the Corps. The Mayor of The Dalles' expression of gratitude for the assistance of Wheeler Rucker, resident engineer at The Dalles-Celilo Canal, typified such comments:

> *As the situation become more critical Mr. Rucker stepped into full charge of all maintenance work and temporary dike construction undertaken. Without him we were faced with an impossible task. It was only through his knowledge of dike construction and years of experience on the Columbia River, together with his untiring effort, that made it possible to keep the downtown area of Dalles City from being flooded. . . . He clearly demonstrated a sagacity in the deployment of men and materials which enabled the accomplishment of the job with the greatest possible degree of efficiency. . . . His imperturbable attitude of quiet, assured direction of the operation gave to all of us a confidence that the undertaking was not impossible.*[12]

During the emergency, District Engineer Colonel Orville Walsh refused to let large vessels use the Columbia River ship channel for fear that wave action, coupled with high tides would send water over the top of the levees. Ship companies objected that he had no authority to issue such orders and threatened to sue the Corps for losses while detained in port. Walsh enforced his order until the river started dropping. He later remarked that "the Chief's Office was a little bit worried that I'd overstepped my authority."[13]

The flood of June 1948 was the greatest single disaster in the history of the Columbia River Basin. The 20-day flood took the lives of 32 people in the Portland District; seven others were never found. The high water completely destroyed a city with a population of over 18,000. At least 50,000 people fled their homes and nearly 5,000 dwellings were destroyed. Suffering, hardship, social and economic dislocation, disease and waste lay in the path of the powerful flood. High water also eroded 100,000 acres of intensively developed agricultural land and submerged 15,000 acres of highly developed commercial, industrial, or urban areas, including 650 blocks of Portland. After careful flood damage appraisal, the Corps of Engineers declared that measurable economic loss exceeded $100 million. Rehabilitation of flood control works in the Portland District cost the government over $2 million.

"531 Report"

The 1948 flood on the Columbia occurred while the Portland District carried out a comprehensive update of the 308 reports of the Columbia River Basin. With the Columbia at high flood stage during June, President Truman ordered the Corps of Engineers to include in its review a study of the long-range flood-control plans for the river basin. Begun in 1944 under the general supervision of the North Pacific Division, the massive study had been divided into 17 parts or problems. Each district analyzed the portions of the problems affecting its territory. The division assigned the entire study of such issues as industrial and agricultural development and power market, navigation, and power distribution to the Portland District.[14]

The Corps held extensive public hearings and worked closely with the Bonneville Power Administration and the Bureau of Reclamation in producing the final report. By October 1948, the North Pacific Division had refined and coordinated the work of the districts; and Congress published the resulting document in eight large volumes as House Document 531 in March 1950. The main control plan to provide flood prevention stood out as the principal feature of the comprehensive report. Other elements of the massive study included electric power generation, navigation, irrigation, and fish and wildlife conservation. A phased completion of the comprehensive development would, according to the Board of Engineers, "create a well-knit system of works for the most efficient utilization of the water resources in the promotion of a balanced economy."[15] The River and Harbor and Flood Control Acts of 1950 contained authorization for the projects recommended in the report.

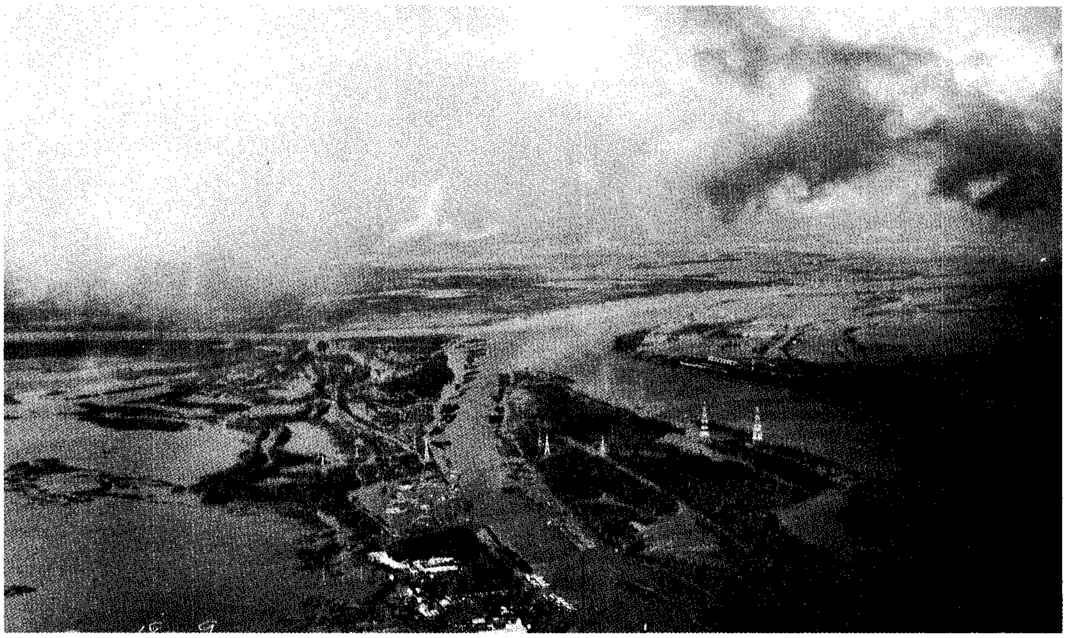
The main control plan proposed to confine future floods to 800,000 cfs, as measured at The Dalles. In the period from 1858 to 1948, 10 destructive floods with unregulated peak discharges of more than 800,000 cfs had occurred. The plan identified two methods to accomplish its flood control goal. First, the engineers outlined a system of upstream multiple-purpose dams and reservoirs to catch and confine runoff, reducing downstream peak discharge. A series of seven reservoirs throughout the Columbia River Basin, including modification and additions to outlets at Grand Coulee Dam, would provide about 21 million acre-feet of usable storage space. Of these seven projects, only John Day Dam came within the Portland District; as eventually built, its flood control capability contained 500,000 acre-feet of storage—a fourth of that originally proposed.[16]

The second component of the engineers' flood control plan called for increasing levee construction on the lower Columbia River. The report pointed out that protection by either storage or levees alone was impractical from both an engineering and economic standpoint.

A practical balance between the methods would confine flood waters up to 800,000 cfs, measured at The Dalles, within river channels. The report listed 25 projects to raise, strengthen, or extend existing levees. Additionally, the engineers' recommended levees, dikes, flood walls, revetments, and drainage facilities for seven unprotected locations along the lower Columbia. The plan also proposed increased bank protection at 66 locations on the lower Columbia flood plain. All of the suggested work was within the Portland District.[17]

The Corps did not build all of the storage projects recommended in House Document 531 because Congress refused authorization or funding. They constructed some to different specification, and private entities erected still others. The Hells Canyon dams built by the Idaho Power Company on the Snake River had greatly diminished flood control capacity compared with the proposed federal dam at that location. The changes in House Document 531 meant that projects developed in the 1950s afforded only about 10.5 million acre-feet of storage, one-half of the capacity originally planned. This reduced volume would have controlled the 1894 flood to only 1.03 million cfs. To provide a greater margin of safety until construction of additionally authorized reservoirs, the Portland District redesigned levee specifications on the lower Columbia to protect against 940,000 cfs on an interim basis. This approach resulted from yet another Corps of Engineers' review study of the Columbia River Basin carried out during the late 1950s. Congress approved the revised flood control work in 1962.[18]

By 1979, the Portland District had completed levee improvements at five sites and continued work at two others on the lower Columbia. In addition to the levee work, the Act



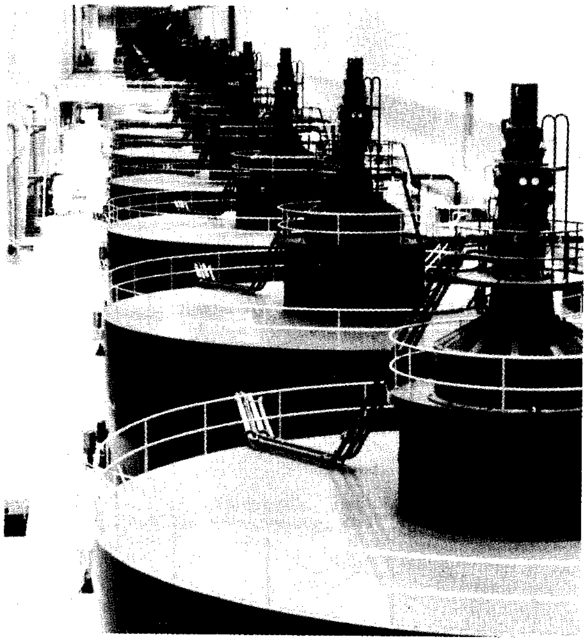
Vast flooding on the Lower Columbia River in 1948.

of 1950 authorized 42 miles of bank protection work at 66 locations. Through 1976, the Corps had finished about 26 miles at 45 Oregon sites. Emergency repairs have been necessary also on a continuing basis to remedy periodic flood damage.[19]

Growth and development along the lower Columbia River after 1948 made the earlier work inadequate at many places. The December 1964 flood especially demonstrated this fact. At the request of local officials, Congress directed the Corps to resume study of the lower Columbia area. In 1973, the Portland District combined this renewed investigation with the Columbia River and Tributaries Study. This review concentrated on finding solutions to the flood problems in the Rivergate-North Portland area. The 1976 interim report on Rivergate-North Portland considered a wide range of approaches to the problems of flood protection, navigation improvements to the Columbia Slough, and fish and wildlife enhancement. After extensive public hearings, the report recommended a perimeter levee; closure of the Columbia Slough; and fish, wildlife, and recreation improvements. The district is reformulating the report to conform with a revised national recreational policy.[20]

The Dalles Dam

The River and Harbor and Flood Control Acts of 1950 also authorized construction of The Dalles Dam, one of the largest projects ever built by the Portland District. The power generated by the dam helped meet the rapidly growing electric loads in the region. Loads served by all utilities in the Northwest from 1937 to 1946 had tripled. Studies showed generating capacity would have to triple again to meet a similar increase in the period 1947-1960. Large industrial customers of Bonneville Power Administration consumed power as fast as they could obtain it, and future industrial development of the region depended upon right: The Dalles powerhouse interior, far right: The Dalles Project's east fish ladder, below: Barge traffic entering The Dalles navigation lock.

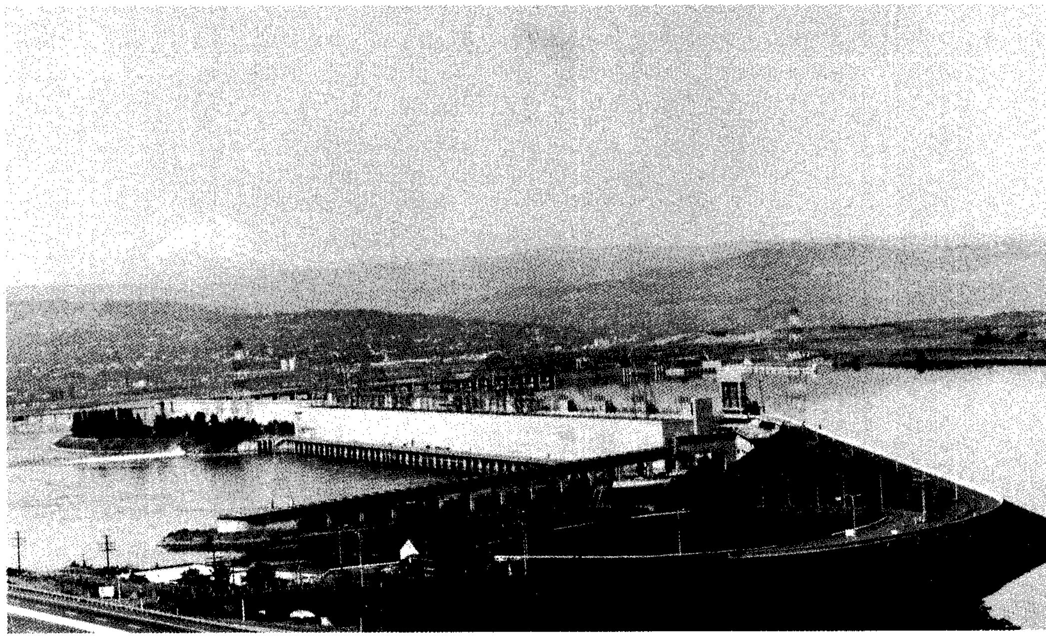


continued availability of low-cost electricity. On a per capita basis, Northwest homeowners used twice the national average of electricity.[21]

A navigation lock at The Dalles Dam replaced the small, outmoded Dalles-Celilo Canal. The inadequate canal hampered barge transportation. The modern navigation lock at The Dalles Dam handled the increased size of tows with minimal delays. The slackwater pool behind the dam connected similar navigation waterways provided by Bonneville Dam and McNary Dam by flooding the numerous rock obstructions in the old open river channel. Since 60,000 acres of land suitable for irrigation lay adjacent to the proposed reservoir, the dam project made irrigation of this area more economical.[22]

Indian fishing rights at Celilo Falls had an important impact on The Dalles Dam project. Under treaties negotiated with the United States in 1855, the Yakima Nation and the Confederated Tribes, the Umatilla Tribes, and the Warm Springs Indians retained the rights of taking fish from streams within or bordering their reservations, of taking fish at all other usual and accustomed places in common with the citizens of the territory, and of erecting temporary buildings for curing fish. The three tribes had intermarried extensively and had, in turn, intermarried with Celilo, Cascade, Klickitat and Wasco Indians.

Construction of the dam would inundate the unique and ancient fishing grounds at and near Celilo Falls. Over 5,000 Indians fished at Celilo Falls in much the same manner as their ancestors had for hundreds of years. Tied to a wooden platform, an Indian using a net or a spear pulled large numbers of fish from the roaring falls. The Indians caught the fish primarily for subsistence, but also for commercial purposes. The Corps estimated that an



The Dalles Lock and Dam on the Columbia River

annual catch of 2.5 million pounds would be lost by the construction of The Dalles Dam. Celilo Falls also served as a favored Indian gathering place for social and cultural events. In compensation for the loss of this valuable site, the federal government awarded $23.5 million to Yakima, Umatilla, Warm Springs, and Nez Perce Indians. The government paid about $4,000 to each Indian and built a new Indian village at the Celilo site.[23]

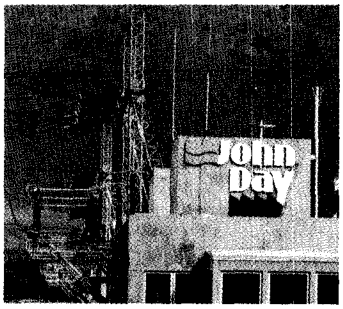
Work on The Dalles Dam started in February 1952. The engineers separated the project into seven prime contracts providing for the spillway dam, the navigation lock, non-overflow structures, fish passage facilities, the powerhouse substructure, the closure dam and appurtenant work, and the installation of mechanized electrical equipment in the powerhouse. By late summer in 1953, the contractors completed the cofferdam and finished excavation for the powerhouse. The workers also accomplished 44 percent of the highway and railroad relocation. In December, laborers poured the first spillway and powerhouse concrete. During the following year, the contractors started the 86 by 675-foot navigation lock. It provided a 15-foot depth over the sills, with a maximum lift of 87.5 feet. Construction on the spillway section, powerhouse, and adjacent fish facilities ran ahead of schedule in 1955.[24]

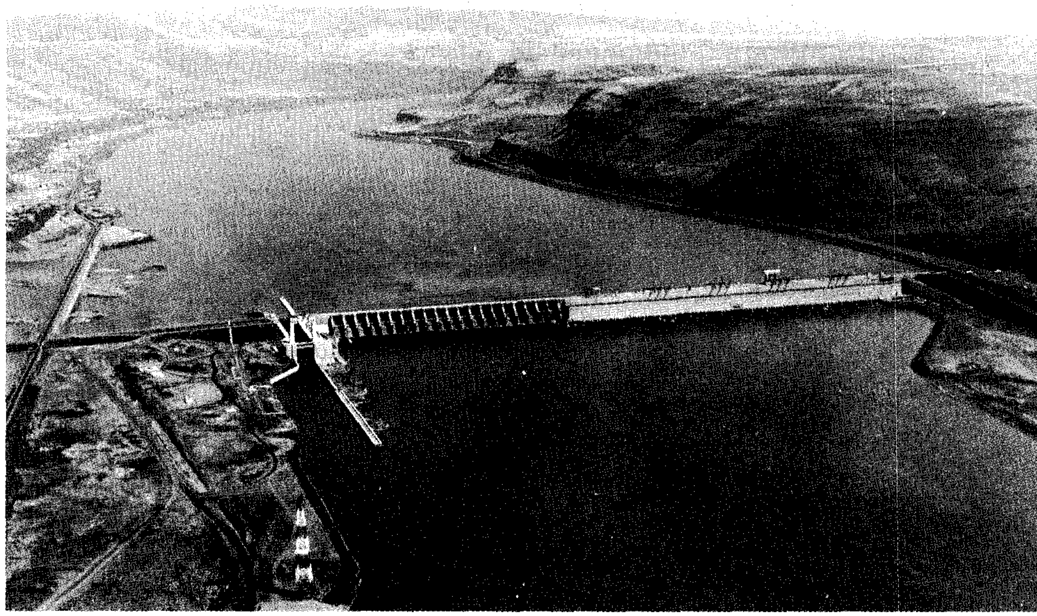
The Portland District superintended completion of the powerhouse substructure for generating units 1 through 14 in January 1956. In April of that year, the contractors finished the 1,380-foot spillway section with 23 radial gates, each of which was 50-feet wide and 43-feet high. The engineers designed the spillway dam to pass a flood of 2.29 million cfs. In June 1956, workers finalized the powerhouse substructure for the last eight generating units. Fish bypass facilities included two ladders, powerhouse collection system and transportation channel, and the lock. By 25 September 1957, the Corps had completed the entire project and power from unit number one came on line. The Portland District added the eight additional units in 1973, giving the plant 1,807,000 kilowatts of installed generating capacity. The 22-unit powerhouse produced more than 9.2 billion kilowatts-hours of electricity during the year ending June 1976. Total construction cost of The Dalles project through 1979 came to $299 million. Vice President Richard Nixon formally dedicated the dam on 10 October 1959.[25]

John Day Dam

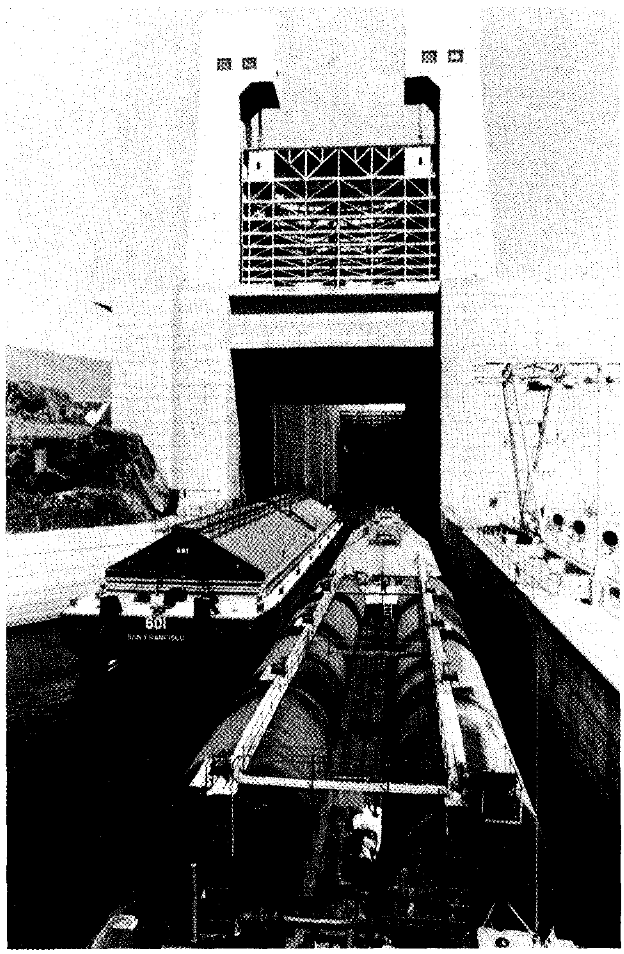
The upper end of Lake Umatilla, impounded by John Day Dam, forms the boundary between the Walla Walla District and the Portland District. The Walla Walla District constructed John Day Dam but transferred it to the Portland District in 1973. Congress authorized the John Day Dam in the River and Harbor and Flood Control Act of 1950 in accordance with recommendations in House Document 531. The Senate Committee on Public Works ordered a review of the project in 1953. This study, conducted by the Portland District, resulted in decreasing the flood control storage at John Day from two million to 500,000 acre-feet of usable storage because of flowage problems inherent with the large surcharge storage. Subsequent revisions increased the power output of the dam.[26]

The Walla Walla District began construction in June 1958 and completed the dam ten years later. The navigation lock at John Day has a maximum lift of 113 feet, among the highest single-lift locks in the world. The slackwater pool extends upstream 75 miles to McNary Dam, greatly benefitting navigation. The 16 powerhouse units have a capacity of 2.16 million kilowatts. At the time of completion, the dam contained the second largest





above: John Day powerhouse transmission towers, right: John Day Lock and Dam on the Columbia River



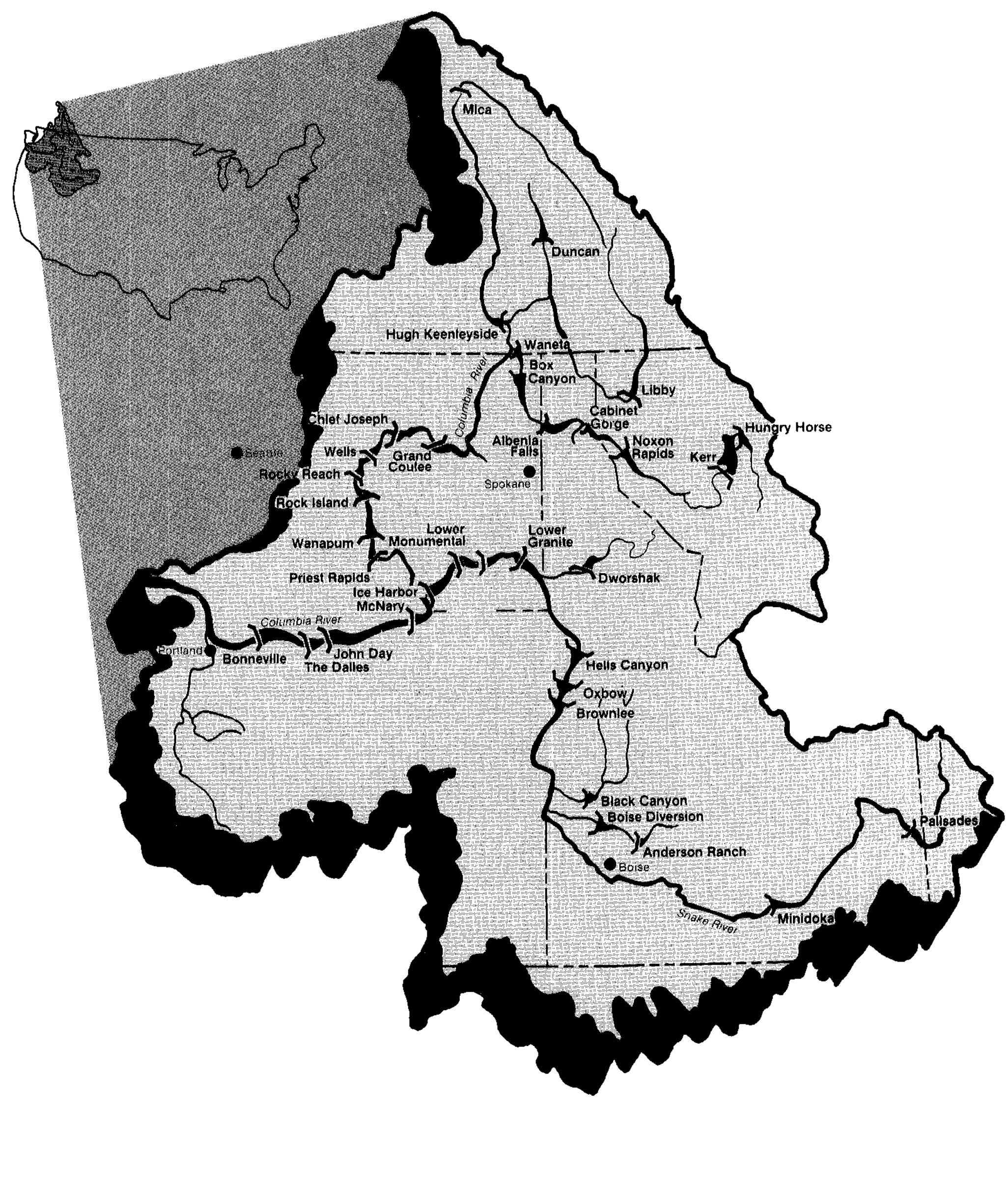
River traffic passing through the John Day navigation lock, one of the highest single lift locks in the United States.

powerhouse in the world. Vice President Hubert Humphrey dedicated the $478 million, mile-wide dam on 28 September 1968. The Portland District assumed operation of the dam in 1974.[27]

On 3 February 1975, an accident in the navigation lock at John Day Dam threatened to close this vital link in the Columbia waterway. A barge tow in the lock slipped its mooring and severely damaged the upstream lock gate and its operating machinery. District personnel immediately moved an emergency floating bulkhead in place to drain the lock and remove the barges. The district then faced the task of resuming lock operations on an emergency basis, while devising and carrying out permanent repairs. Lockages using the floating bulkhead required four to six hours to complete, as opposed to a normal cycle of three-fourths of an hour. Efficient operations necessitated close cooperation between the district and navigation companies. By 5 February, the parties had worked out such arrangements and vital river traffic resumed. At the time of the accident, the lock yearly carried 3.5 million tons of fuel, fertilizer, and grain.

After lowering the damaged gate into its recess below the lock sill, design personnel studied the repair options. The possibilities included repairing the existing gate, constructing a new one, or borrowing an existing gate from the Lower Monumental Dam on the Snake River. After weighing the alternatives, the engineers decided that the quickest and least expensive solution called for constructing a new gate. In the meantime, experience with the floating bulkhead enabled operators to reduce lockage time to about 1.5 hours. This eased the pressure for immediate repairs. The district had the new gate fabricated and installed and other repairs completed by 20 October 1975. As Colonel Clarence D. Gilkey noted, quick work and "co-operation on the part of navigation companies, Corps employees, and contractors and suppliers" overcame "an accident which potentially could have closed the river for a period of eight or nine months."[28]

The contribution of the Portland District to the multiple-purpose development of the Columbia River Basin included the planning work on the four projects on the lower Snake, beginning construction on McNary Dam, carrying out the construction and operation of Bonneville and The Dalles Dams, and assuming the operation of John Day Dam. In over 40 years since work started at Bonneville, the Columbia has been transformed from an untamed and, at times, destructive river to a slackwater navigation stream and a major producer of hydroelectricity.



Map of the Columbia River Basin area showing completed river projects on the Columbia and its tributaries.

Columbia River Development Treaty

The lower Columbia River Flood control efforts of the Portland District, part of a basin-wide program, greatly advanced in September 1964 when the United States signed the Columbia River Development Treaty with Canada. The treaty provided that Canada build three dams—Mica, Duncan, and Arrow—and that the Corps' Seattle District build one—Libby Dam—to produce about 20 million acre-feet of usable storage. The treaty divided storage capacity between flood control and power purposes. The impoundment provided by the four Canadian treaty dams greatly lessened flood threats on the Columbia River. Flood control projects previously constructed by the Corps in accord with the 1950 and 1962 River and Harbor and Flood Control Acts can reduce an 1894-size flood, lowering flood stages at Vancouver from 37 to 31 feet. The Canadian treaty dams, with the two million acre-feet of flood control storage provided by the Corps-built Dworshak Dam, will further control an 1894 flood to 720,000 cfs, and 26.5-foot stage at Vancouver. The North Pacific Division has responsbility for the flood control regulation of the Columbia River system.[29]